PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Kenji INAGE et al. Group Art Unit: 2652

Application No.: 09/911,408 Examiner: B. Miller

Filed: July 25, 2001 Docket No.: 110199

For: MAGNETORESISTIVE DEVICE AND METHOD OF MANUFACTURING SAME AND THIN-FILM MAGNETIC HEAD AND METHOD OF MANUFACTURING SAME

DECLARATION UNDER 37 C.F.R. §1.132

I, Kenji Inage, a citizen of Japan, hereby declare and state:

1. I have an M. Eng. degree in Materials Engineering which was conferred upon me by Graduate School of Engineering, Hiroshima University in Hiroshima, Japan, in 1996.

2. I have been employed by TDK Corporation since 1996 and I have had a total of 9 years of work and research experience in development of GMR/TuMR heads.

3. My publications include the following work in this field: "ESD Sensitivity and Thermal Stability of Spin-Valve Head With Pinned Synthetic Ferrimagnet", InterMag 2000.

4. I and/or those under my direct supervision and control have conducted the following tests:

A comparative experiment was performed on the disclosed and claimed device of application No. 09/911,408 vs. the device disclosed in U.S. Patent No. 6,587,315 to Aoki et al. (hereinafter "Aoki's Device"). In the experiment, relationship between electrode spacing (MRT1) and frequency of occurrence of Barkhausen noise was studied on two types of

magnetoresistive devices, that is, type A and type E, which are discussed in the above-identified application and also discussed below. In the following description, same symbols are used as those in the above-identified application. Specifically, L_1 represents the overlap amount of one of the bias field applying layers 18. L_0 represents the overlap amount of one of the electrode layers 6. MRT1 represents the electrode spacing, that is, space between the two electrode layers 6.

Type A magnetoresistive device has a structure in which neither of the bias field applying layers 18 and neither of the electrode layers 6 overlap the top surface of magnetoresistive (MR) element 5, as shown in FIG. 7 of the above-identified application. In type A, each of L_1 and L_0 is 0.00 μm.

Type E magnetoresistive device has a structure in which the bias field applying layers 18 do not overlap the top surface of the MR element 5 but the electrode layers 6 overlap the top surface of the MR element 5. In type E, L_1 is 0.00 μm while L_0 is 0.08 μm.

The claimed device and Aoki's device are type E. Basically, type E has similar structure as type B used in the experiment described in the above-identified application, the results of which are shown in Table 2 and FIG. 16. Type B and type E are different in the value of L_0, that is, L_0 of type B is 0.10 μm while that of type E is 0.08 μm. The reason for making the value of L_0 0.08 μm in type E is that Aoki teaches that a preferable range of overlap of each electrode layer (L_0) is 0 to 0.08 μm (see, for example, col. 18, lines 37-39).

The experiment results on the relationship between the electrode spacing MRT1 and the frequency of occurrence of Barkhausen noise in these two types of devices are shown in Table A and FIG. B attached hereto. The figures in the table indicate the frequency of occurrence of Barkhausen noise in percent.

Claims 5, 10, 15 and 20 of the above-identified application correspond to devices of

type E in which the electrode spacing MRT1 is equal to or smaller than 0.6 μm. Claims 29, 32, 35 and 38 of the above-identified correspond to devices of type E in which the electrode spacing MRT1 is equal to or smaller than 0.4 μm. Aoki's device corresponds to devices of type E in which the electrode spacing MRT1 is 1.24 to 1.4 μm, as calculated based on Aoki's teaching (see for example, Amendment filed herewith at page 14).

As shown in Table A and FIG. B, in the range in which the electrode spacing MRT1 is greater than 0.6 μm, there is no great difference in the frequency of occurrence of Barkhausen noise between type A and type E. However, in the range in which the electrode spacing MRT1 is equal to or smaller than 0.6 μm, particularly in which the electrode spacing MRT1 is equal to or smaller than 0.4 μm, the difference between type A and type E in the frequency of occurrence of Barkhausen noise becomes greater as the electrode spacing MRT1 decreases. Specifically, in the range in which the electrode spacing MRT1 is equal to or smaller than 0.6 μm, particularly in which the electrode spacing MRT1 is equal to or smaller than 0.4 μm, the frequency of occurrence of Barkhausen noise in type A increases as the electrode spacing MRT1 decreases, whereas the frequency of occurrence of Barkhausen noise in type E decreases as the electrode spacing MRT1 decreases. Thus, the electrode spacing of "equal to or smaller than approximately 0.6 μm" as recited in claims 5, 10, 15 and 20, and the electrode spacing of "equal to or smaller than approximately 0.4 μm" as recited in claims 29, 32, 35 and 38 are critical.

In contrast, in type E, when the electrode spacing MRT1 is in the range suggested by Aoki, that is, 1.24 to 1.4 μm, the frequency of occurrence of Barkhausen noise is greater as compared with the case where the electrode spacing MRT1 is equal to or smaller than 0.6 μm, particularly equal to or smaller than 0.4 μm. Furthermore, when the electrode spacing MRT1 is 1.24 to 1.4 μm as suggested by Aoki, the frequency of occurrence of Barkhausen

noise does not decrease as the electrode spacing MRT1 decreases. Therefore, the electrode spacing of "equal to or smaller than approximately 0.6 μm" as recited in claims 5, 10, 15 and 20, and the electrode spacing of "equal to or smaller than approximately 0.4 μm" as recited in claims 29, 32, 35 and 38 provide an unobvious and unexpected result over Aoki.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: September, 12, 2005

Kenji Inage

Kenji Inage

Attachment:

Table A and Fig. B

[Table A]

MRT1 (μm)	A	E
0.2	28.9	9.6
0.3	24.0	10.3
0.4	18.7	11.0
0.5	16.0	13.0
0.6	16.0	13.1
0.7	14.0	13.3
0.8	14.4	13.2
0.9	12.4	13.1
1.0	13.2	13.2
1.24	13.4	13.3
1.5	13.0	13.2

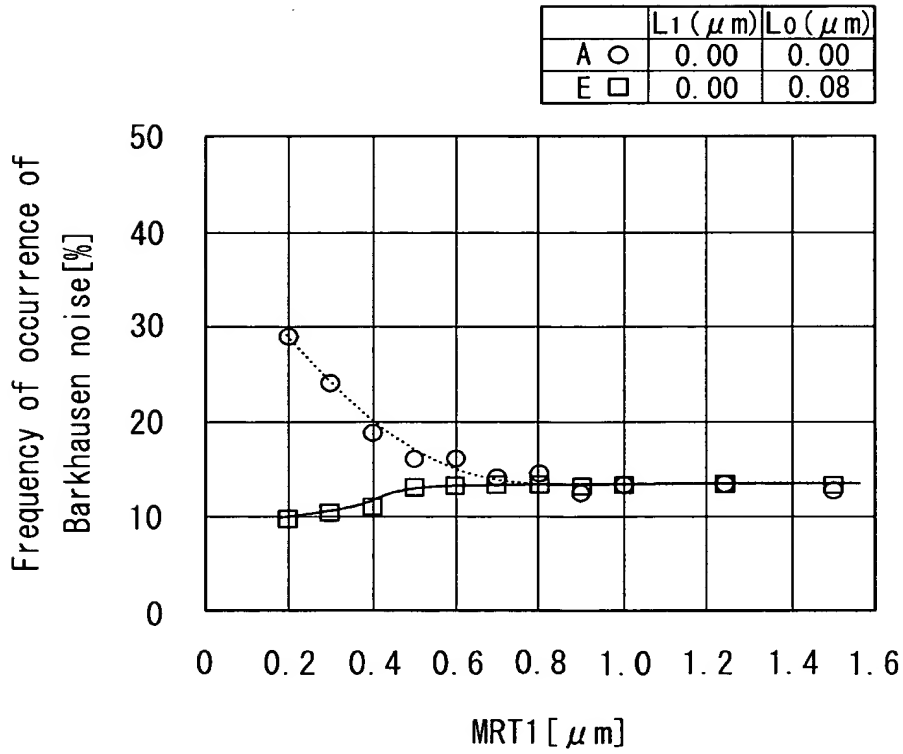

FIG. B